IN THE DISTRICT COURT OF THE VIRGIN ISLANDS
DIVISION OF ST. CROIX

JOSEPHAT HENRY resident of Harvey, KAY WILLIAMS resident of Harvey, SYLVIA BROWNE resident of Clifton Hill, MAUDE DREW resident of Estate Barren Spot, MARTHA ACOSTA resident of Estate Profit, WILHELMINA GLASGOW as an individual and mother and next friend of SAMANTHA VIERA, a minor, both residents of Estate Profit, MERCEDES ROSA resident of Estate Profit, GEORGE RODRIGUEZ as an individual and as father and next friend of AMADO and GEORGE E. RODRIGUEZ, Minors, all residents of Estate Profit, SONYA CIRILO resident of Estate Profit, RAQUEL TAVAREZ, resident of Estate Profit, NEFTALI CAMACHO, as an individual and as father and next friend of ANGEL JAVIER CAMACHO, a minor, both residents of Estate Profit, EYAJIE MALAYKHAN resident of Estate Profit, KELSHALL CHEDDIE resident of Estate Profit and other persons too numerous to mention, A CLASS ACTION, Plaintiffs, v. ST. CROIX ALUMINA, LLC, ALCOA INC., and GLENCORE, LTD, f/k/a CLARENDON, LTD., Defendants. _____	)	CIVIL NO. 1999/0036

MEMORANDUM IN OPPOSITION TO DEFENDANTS' *DAUBERT* MOTION TO EXCLUDE THE REPORTS, OPINIONS, AND TESTIMONY OF CLAYTON A. BOCK, CIH

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I. SUMMARY

Clayton Bock, a certified industrial hygienist, was hired to investigate the source and extent of Plaintiffs' exposures to the materials released from St. Croix Alumina, L.L.C.'s ("SCA") alumina refinery and to identify the potential health effects associated with those exposures. As a certified industrial hygienist with twenty years of experience assessing risks associated with environmental emissions, Mr. Bock is particularly well qualified to offer opinions on the identity and magnitude of emissions and their related health consequences. *See* **Ex. A,** FUNDAMENTALS OF INDUSTRIAL HYGIENE, Barbara A. Plog, ed., NCS (1988), at 574 ("An industrial hygienist is an individual who, by virtue of special studies and training, has acquired competence and the ability to recognize and evaluate the hazard potential of environmental factors and stresses... and to understand their effect on people[.]"). Defendants ignore Mr. Bock's substantial expertise in the field and contend that his testimony on these issues should be excluded because he lacks the requisite qualifications. Defendants' motion, which displays a startling lack of knowledge or appreciation of the field of industrial hygiene, is without merit and should be denied.

Defendants' motion is also fatally flawed in that it overwhelmingly relies on a misplaced argument. For approximately eighteen pages of their memorandum, Defendants complain that Mr. Bock's opinions should be excluded because the "ATA Red Mud Test" did not reliably replicate the hurricane, and thus, did not provide a reliable basis for determining how much red mud entered Plaintiffs' homes. D.Mem., at 3-21.[1] That argument misses the point. As Mr. Bock explained during

[1] References to Memorandum in Support of Defendants' *Daubert* Motion regarding Mr. Bock are indicated by "D.Mem.," and references to exhibits attached thereto are indicated by "D.Ex." All other exhibits referenced herein are attached to the Affidavit of Lee Rohn, filed with this memorandum of law. Plaintiffs' Overview Brief Responding to Defendants' *Daubert* Challenges provides the factual background and sets forth pertinent legal standards with respect to this response, and it is incorporated herein for all purposes.

his deposition (and as discussed in Section II(D), *infra*), the results of the ATA Red Mud Test did not inform his opinion regarding the amount of red mud that entered Plaintiffs' homes. **Ex. B**, Bock Dep. vol. 1, at 150:18-21, 151:3-6, 190:6-18. Rather, the results of the test provided information regarding the propensity of red mud, once introduced into a home, to persist and to become re-entrained during normal household activity. *Id.*

Moreover, Defendants largely ignore those opinions that are at the heart of Mr. Bock's testimony – that winds and rain from Hurricane Georges carried red mud from the SCA facility into Plaintiffs' neighborhoods and homes, that the pH of the red mud was elevated, that exposure to red mud could cause the type of injuries Plaintiffs suffered, and that Plaintiffs experienced significant exposure to SCA red mud as a result of the hurricane. None of these opinions rely on the ATA experiment. Because Defendants do not provide any reasonable basis for excluding Mr. Bock's testimony, and because, as detailed below, Mr. Bock's opinions are well-grounded on ample reliable data, Defendants' motion should be denied.

II. ARGUMENT

A. Mr. Bock is Well Qualified to Testify Regarding Industrial Emissions and their Significance to Human Health.

In determining whether a witness is qualified as an expert, "[a]ll that is necessary is that the witness have some special or technical knowledge and experience so that he may enlighten laymen (judge and jury) in an area beyond their competence and comprehension." *Government v. Olivera*, 1971 U.S. Dist. LEXIS 5090, *5-6 (D.V.I. Nov. 26, 1971). Factors to be used in determining expert qualifications include: education, practical experience, study, research and general background. *Id.* Federal courts have further held "a broad range of knowledge, skills, and training qualify an expert as such," and have avoided "imposing overly rigorous requirements of expertise." *United States*

v. Velasquez, 64 F.3d 844, 849 (3d Cir. 1995) (citing *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 741 (3d Cir. 1994)). An expert is competent to express an opinion if he has a "reasonable pretension to the specialized knowledge on the subject under investigation." *Turbe v. Robert A. Lynch Trucking, Inc.*, 1999 WL 1087026, *3 (Terr. V.I. Oct. 7, 1999) (quoting *Arnold v. Loose*, 352 F.2d 959, 962 (3d Cir. 1965)). Accordingly, "[h]e must show at least a general familiarity with the field or that he had some opportunity or means of acquiring special knowledge or experience with reference to the particular question." *Id.*

Clayton Bock's practical experience, study, research, and general background for the past twenty years has been in environmental health and industrial hygiene. Industrial hygiene has been defined as "that science and art devoted to the anticipation, recognition, evaluation and control of those environmental factors or stresses arising in or from the workplace, which may cause sickness, impaired health and well-being, or significant discomfort among workers or among citizens of the community." Ex. A, Fundamentals of Industrial Hygiene, *supra*, at 3 (emphasis added).

Mr. Bock has a bachelor's degree in environmental health and a master's degree in environmental health and safety. **Ex. E**, Resume of Clayton A. Bock; **Ex. F**, Bock Report, at ii-iii. He holds a certification in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene and is a member of the American Conference of Governmental Industrial Hygienists. **Ex. F**, Bock Report, at ii-iii.

Mr. Bock currently holds the positions of Vice President and Business Unit Leader in the Natural Resources Industry & Infrastructure division of MWH Americas, Inc. **Ex. B**, Bock Dep. vol. 1, at 10:18-20, 11:23-12:4; **Ex. D**, Bock Dep. vol. 3, at 410:11-12. Mr. Bock has served as the Principal Consultant with EORM, Inc., a company specializing in evaluating environmental risks

and formulating responses to those risks. **Ex. F**, Bock Report at ii-iii. He has also held positions of Vice President, Director of Health and Safety, and National Technical Director for EA Engineering Science and Technology, Inc.; Corporate Health and Safety Supervisor and Trainer for Canonie Environmental Services Corp.; and Health and Safety Officer for MAECORP Environmental Solutions, Inc. *Id.*

During his career, Mr. Bock has been hired to evaluate dozens of environmental contamination project sites throughout the United States, including various Superfund sites. Those projects have routinely involved evaluations of potential and actual exposures to chemicals via inhalation, ingestion, and skin absorption as a result of industrial releases. *Id.* Thus, Mr. Bock has substantial experience assessing the sources, magnitude, and consequences of releases of industrial emissions. *Id.*

As a result of his specialized training and experience, Mr. Bock has developed a broad knowledge base regarding the risks associated with exposures to environmental contaminants. **Ex. D**, Bock Dep. vol. 3, at 416:23-417:16. Indeed, over the course of Mr. Bock's 20-year career, he has written hundreds of health and safety plans addressing various contaminants, constituents, and/or hazards associated with materials used and disposed of by industry. *Id.* at 417:6-11. Further, it is not necessary, as Defendant contends, that an industrial hygienist be an expert in the particular substance at issue, such as red mud, in order to be qualified to apply his knowledge and expertise to the given situation.[2] *See, e.g., Velasquez, supra*, 64 F.3d at 849; *Kannankeril v. Terminix Int'l,*

[2] Defendants' own expert testified that he has come to consider himself an expert on red mud and bauxite, notwithstanding that his only encounter with red mud occurred nine months before his deposition and specifically for this case, and he has never conducted any tests on red mud. **Ex. I**, Machado Dep., at 71:13–72:7; 76:9–77:15. Under *Daubert*, there is no requirement for prior experience directly related to red mud and bauxite. *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993).

Inc., 128 F.3d 802, 809-810 (3d Cir. 1997) (holding that an expert need not be a specialist in the chemical at issue to provide expert testimony on the causation of an injury from exposure to that chemical). Thus, Mr. Bock is eminently qualified to opine on the source and nature of Plaintiffs' exposures as well as the harm that can result from those exposures.[3]

B. Mr. Bock's Opinions Are Based on Reliable Data and Sound Methodology and Will Assist the Trier of Fact.

As the Supreme Court held in *Daubert*, it is the role of the district court to ensure that evidence presented by an expert "is not only relevant, but reliable." *Daubert v. Merrell Dow Pharm., Inc*., 509 U.S. 579, 589 (1993). Thus, an expert's opinions "must be based on the methods and procedures" relied on in their field of expertise, rather than on "subjective belief or unsupported speculation[,]" and the expert must have "good grounds" for his or her belief. *Daubert*, 509 U.S. at 590. It is not required, however, that an expert's opinion have "the best foundation" or be "demonstrably correct," but only that the "'particular opinion is based on valid reasoning and reliable methodology.'" *Oddi v. Ford Motor Co.*, 234 F.3d 136 (3d Cir. 2000) (quoting *Kannankeril*, 128 F.3d at 806). Additionally, expert testimony based on inferences "derived from the facts of the case at hand" are permissible under *Daubert*. *Jahn v. Equine Servs*., 233 F.3d 382, 390 (6th Cir. 2000). "As long as an expert's scientific testimony rests upon 'good grounds, based on what is known,' it should be tested by the adversary process – competing expert testimony and active cross-examination – rather than excluded from jurors' scrutiny for fear that they will not grasp its complexities or satisfactorily weigh its inadequacies." *Ruiz-Troche v. Pepsi Cola Bottling Co.*,

[3] As Mr. Bock made clear at his deposition, he will not be offering any opinions regarding the most probable cause of Plaintiffs' injuries. Rather, his testimony will address the type of injuries that may result from exposure to red mud and bauxite, an opinion that falls squarely within the field of industrial hygiene. **Ex. D**, Bock Dep. vol.3, at 568:18-569:2, 577:9-22, 579:10-18.

161 F.3d 77, 85 (1st Cir. 1998).

Mr. Bock has discussed at great length, both in his original and supplemental reports and at his depositions, the substantial body of evidence that supports his opinions that (a) red mud was emitted during Hurricane Georges, (b) the pH of the red mud was elevated, (c) exposure to red mud could cause the type of injuries Plaintiffs suffered, and (d) Plaintiffs experienced significant exposures to the caustic red mud. As demonstrated below, these opinions are based on relevant and reliable data, were reached through the application of accepted principles of industrial hygiene, and will assist the jury in determining whether Plaintiffs were injuriously exposed to substances released from the SCA refinery.

Further, Defendants' contention that "**certain of Mr. Bock's opinions** should be excluded" (*See* D.Mem. at 2) reveals a fatal flaw in their motion, because the opinions Defendants actually argue should be excluded are, by and large, not opinions that Mr. Bock intends to offer at trial. Indeed, the majority of Defendants' motion is devoted to opinions that Mr. Bock has already said he will not be offering – that is, opinions based on the airborne concentration of red mud during the ATA experiment. After devoting the bulk of their brief to arguing a moot point, Defendants summarily aver that no other reliable data support Mr. Bock's opinion. D.Mem. at 22. Defendants' argument is unfounded.

1. Mr. Bock's Opinion that Red Mud was Released During Hurricane Georges is Based on Substantial Evidence.

In assessing whether red mud (bauxite residue)[4] from the SCA facility was released into the community during Hurricane Georges, Mr. Bock considered (1) industrial processes at SCA,

[4] The terms "bauxite residue" and "red mud" are synonymous. **Ex. J**, Williams Dep., at 52:22-53:8. In general, "red mud" is used in this memorandum; however, various corporate and governmental documents use the term "bauxite residue."

including extraction processes, as well as materials handling, storage, and disposal practices; (2) the size and location of the red mud disposal piles; (3) the chemical and physical properties of the red mud; (4) the weather conditions around the time of the incident at issue; and (5) the conditions existing in the community after the hurricane. Materials Mr. Bock relied on in reaching the conclusions expressed in his original and supplemental report include (1) SCA materials management plans and operating permit applications; (2) site assessments conducted for Alcoa by Geraghty & Miller, Inc. as well as other internal corporate documents; (3) depositions and reports of experts for Defendants and Plaintiffs; (4) eyewitness accounts; (5) reports by government agencies, including the United States Environmental Protection Agency and the Department of Planning and Natural Resources; and (5) Mr. Bock's first-hand observations.

Among the material reviewed by Mr. Bock, the 1995 assessment of the SCA facility by a consultant for Defendants provides crucial data regarding the likelihood of substantial fugitive red mud emissions during hurricane force winds.[5] **Ex. G**, Bock Supp. Report, at 5; **Ex. K**, Geraghty & Miller, 1995 Site Assessment Report, at A1000882, A1000899. In their assessment, Geraghty & Miller determined that SCA did not appear to use good materials handling practices and identified a need to investigate the potential for releasing fugitive dusts into the environment. *Id.* The report also indicated that control measures were inadequate to mitigate erosion from red mud disposal areas. *Id.* Unanswered complaints and concerns from the community regarding red mud disposal at the site were also noted in the Geraghty & Miller report. *Id.*

Other Alcoa documents similarly reveal that fugitive emissions from the site were a "major

[5] Notably, the assessment, which was performed by Defendants' own independent contractors, was wrongfully withheld from Plaintiffs during the many years of discovery in this litigation. *See* Doc. No. 1124, Order dated 8/6/07. Once the assessment was uncovered, the Court granted Plaintiffs leave to permit their experts to address the reported findings.

community concern" and that "bauxite residue dusting" was a source of the fugitive emissions. **Ex. L**, SCA, Bauxite Residue Management Master Plan (Sept. 2000), at WILL000648. Corporate documents also indicate that during a public hearing regarding expansion of the red mud area, residents had complained of "contamination of cistern water, red spots on curtains after rains, excessive dirt in their houses and health effects such as skin rashes and asthma." **Ex. HH**, Staff Recommendation, Expansion of Red Mud Storage Area, at 4 (Sept. 6, 1994).

The 1994 inspection of the site by DPNR also revealed that dust was "ubiquitous" at the SCA refinery, and that "[a]lthough dust was not apparent in the air, a drizzle during the inspection deposited red mud on the white shirts, faces and arms of staff indicat[es] its presence in the air." *Id.* (emph. supp.). Defendants may attempt to argue that the red dust was bauxite, but that is contradicted by testimony that 100% of bauxite dust was captured or contained. **Ex. N**, Black (SCA environmental manager) Dep., at 70:19 - 71:4 & 177:10-21.

The testimony of Defendants' experts Mr. Williams and Dr. Wagh further supported the finding that red mud was released during the hurricane. **Ex. H**, Addendum to Bock Supp. Report, Apr. 7, 2008. Mr. Williams, a chemical engineer and lifelong Alcoa employee who was directly involved in Alcoa's work on red mud disposal, identified several reasons why red mud piles are prone to dusting. **Ex. J**, Williams Dep., at 14:22, 98:17-99:14; 109:25–110:2; 111:3–113:24. Mr. Williams explained that as red mud piles dry out, they become susceptible to wind erosion. *Id*. at 98:17–99:14; 109:25–110:2. Mr. Williams testified that the disposal of red mud can lead to dusting problems unless the red mud is completely submerged under water, which was not done at the SCA site. *Id.* at 154:24–156:11; 158:1-19.

A report published by Dr. Wagh prior to this litigation provides additional evidence of the

potential for release. In the report, he explained that St. Croix red mud was easy to powder because of the fine particle size of the red mud. **Ex. F**, Bock Report, at 12-13; **Ex. Q**, Arun S. Wagh, Ph.D., "Physical and Chemical Characteristics of Bayer Process Waste (Red Mud) from Virgin Island Alumina Refinery at St. Croix and an Assessment of its Potential for Commercial Utilization, Oct. 31, 1999, at 3, 5 (Bock 006185, 006187); **Ex. M**, Wagh Dep., at 118:24 - 119:3. Dr. Wagh has also reported that dried out red mud piles are a "potential dust bowl," and that "both sun and wind...augment dust pollution." **Ex. O**, Wagh & Thompson, A Study of Inter-particle Bonds in Dry Bauxite Waste Resulting in Atmospheric Aerosols, 37 Physica Scripta 305, 305 (1988). Dry stacking, which is the cheapest method of red mud disposal, increases the potential for dust emissions, which generally consist of fine bauxite residue particles. **Ex. M**, Wagh Dep., at 149, 165. Dr. Wagh acknowledged that, given these conditions, a strong wind can blow a "red dust cloud" over the surroundings, even if the red mud is hardened. **Ex. M**, Wagh Dep., at 112.

The testimony of Defendants' experts in this regard is consistent with other evidence produced by Alcoa, including a document explaining that "dry stacking [as was used at SCA] does increase the potential for dust emissions to be generated [and] residue dust is generally fine bauxite residue particles." **Ex. R**, Alcoa in Australia (2003). A case study of another Alcoa site that employed dry stacking reported "fine carbonate powder" on the red mud surface, and noted that given the presence of high winds averaging 40 to 50 km/hr [approximately 25 to 31 mph], "the potential dust impact to the town of Pinjarra is significant." **Ex. P**, Dep't of the Environ, Dust Control Case: Alco, Pinjarra, Western Australia, at Klepp 1691 (Apr. 2005).

The meteorological data reviewed by Mr. Bock further support his finding that red mud was carried by the hurricane winds into the nearby communities. A storm report issued by the National

Weather Service reported that Hurricane Georges impacted St. Croix on September 21, 1998. Winds of 95 mph and gusts of 113 mph were reported. **Ex. F**, Bock Report, at 4. The data indicated that strong winds were occurring for more than 2.5 hours before heavy rainfall and that winds were blowing from the St. Croix Alumina site toward the Plaintiffs' residential neighborhoods for at least 40 minutes prior to heavy rainfall. *E.g.*, **Ex. F**, Bock Report, at 4; **Ex. C**, Bock Dep. vol. 2, at 256:9-23; 257:13-258:3; 260:17-261:2; 381:2-382:24.

Mr. Bock also reviewed documents drafted by the DPNR, the EPA, and the Agency for Toxic Substances and Disease Registry ("ATSDR") to obtain information about the release of red mud from the SCA site. Three days after Georges, DEP inspectors observed that roadsides, roofs, driveways, and cisterns in the neighborhoods around the SCA site were covered in red dust. **Ex. F**, Bock Report, at 5; **Ex. S**, DPNR Memo. 9/24/98; **Ex. T**, DPNR Fact Sheet, Bauxite Contamination, Oct. 5, 1998. According to the DPNR, SCA employees reported that the bauxite storage facility had been damaged during the hurricane and that an undetermined amount of bauxite was released from the facility. **Ex. T**, DPNR Fact Sheet. The DNPR determined that the released bauxite was carried by the high winds and then settled onto homes and into cisterns of nearby residents. *Id.*; *see also* **Ex. S**, DPNR Interoffice Memo. 9/24/98 (three days after the hurricane, DEP inspectors observed red dust in the neighborhoods, including a drive way "covered with 'red dust'"). There is no evidence, however, that the DPNR conducted its own investigation into whether red mud was also a source of the off-site contamination.

As a result of the report of released bauxite, the ATSDR conducted an assessment of cistern water contamination. **Ex. F**, Bock Report, at 5. The ATSDR determined that contamination of the cistern water by bauxite materials was indicated by the elevated lead and sodium in cistern drinking

water. **Ex. F**, Bock Report, at 25; *see also* **Ex. U**, ATSDR Report. Although the report did not address bauxite waste (red mud), the cistern sample results support the conclusion that red mud was present. For example, the levels of aluminum and iron in the water support a finding of red mud contamination. **Ex. K**, Geraghty & Miller, 1995 Site Assessment Report, at 3-14. That conclusion is further supported by the EPA's finding of elevated sodium levels days after the hurricane (D.Ex.18 at Tarr-02064-65; **Ex. I**, Machado Dep., at 381:22–386:4) because red mud has elevated levels of sodium, while bauxite does not.[6]

Mr. Bock also considered whether the emissions from the SCA refinery were primarily bauxite or bauxite residue. Because the EPA and ATSDR documents did not distinguish between the presence of bauxite and bauxite reside, Mr. Bock reviewed additional evidence to determine whether one of the materials contributed more heavily to total emissions. Mr. Bock thus noted that SCA stored the less hazardous, but more commercially valuable raw material, bauxite in an enclosed structure, while they dumped the more hazardous, but less commercially valuable, red mud waste into unprotected and unsecured open piles at a higher elevation than the bauxite. **Ex. F**, Bock Report, at 3, 13. He also considered the fact that the red mud would have had a smaller particle size than the bauxite, and thus, a greater propensity for dusting. **Ex. G**, Bock Supp. Report, at 4-5; *see also* **Ex. M**, Wagh Dep., at 120:21-23. Thus, the evidence taken as a whole led to the conclusion that, while bauxite was also released from the SCA facility when the protective structure was

[6] *See* **Ex. Q**, Wagh, Physical & Chemical Characterization of Bayer Process Waste (Red Mud) from Virgin Island Alumina Refinery at St. Croix, at 8 Table 1 (Oct. 31, 1993) (showing approximate ratio of 1000:1 for sodium in red mud compared to sodium in bauxite). *Compare* **Ex. V**, Tarr Ref. 7, Oct. 24, 1996 SCA red mud data (showing 8.08% to 10.58% sodium oxide in red mud) & **Ex. W**, Dames & Moore, Red Mud Storage Study (1977), at SCA 000484 (showing "major" levels of sodium in red mud) *with* D.Ex.20, Sept. 23, 1998 SCA bauxite data (sodium oxide "non-detectable" in bauxite). *See also* D.Ex.3 at 6-7, Environ Report (bauxite is exposed to sodium hydroxide in the Bayer process, and sodium remains in red mud); **Ex. I**, Machado Dep., at 299:11-24 (Defendants' expert acknowledges that sodium is in red mud but fails to include these findings in his analysis).

damaged during the hurricane, the majority of the red material carried into the neighboring communities and homes would likely have consisted of the red mud from the open piles.

2. Mr. Bock's Opinion That the pH of the Red Mud Was Elevated Is Based on Substantial Evidence.

While Alcoa's own MSDS for red mud indicates that the pH of the material is between 10 and 12, *See* **Ex. X**, Alcoa MSDS for Red Mud, at Bock 005938, additional data support a finding that the pH of the red mud released from the site was at least as high as 11 and up to 12.7. Most notably, the Geraghty & Miller site assessment conducted for Alcoa at the SCA refinery reported that "[t]he pH of groundwater adjacent to the new (Monitoring Wells GM-13 and GM-13D) and old (Monitoring Well GM-22) red mud ponds is in excess of 12." **Ex. K**, Geraghty & Miller Site Assessment, at 6-7 (A1000903); *see also* **Ex. D**, Bock Dep. vol.3, at 433:24-434:8 (discussing his reliance on Geraghty & Miller's pH findings). Specific data relied on by Geraghty & Miller include samples from individual wells showing pH levels of 12.67, 12.94, 12.3, and 12.7. **Ex. K**, Geraghty & Miller Site Assessment, at Table 3-4 (A1000912); **Ex. G**, Bock Supplemental Report, at 4. In their report, Geraghty & Miller determined that the extremely high pH of the groundwater in the monitoring wells was "a signature of impacts to groundwater quality resulting from red mud disposal." **Ex. K**, Geraghty & Miller Site Assessment at 3-14 (A1000867); *see also* **Ex. D**, Bock Dep. vol. 3, at 441:2-14, 18-21; 442:7-10. Indeed, Defendants' own expert Mr. Machado testified that he expected that the water draining from the SCA red mud pile would have been "representative of the pH in the pile." **Ex. I**, Machado Dep., at 436:3-6. The data further supports the finding that the pH of the red mud would be at least as high as the groundwater samples given the fact that rainwater would have had the effect of lowering the pH in the wells. **Ex. G**, Bock Supp. Report, at 4. Given this data, Mr. Bock had reasonable basis to conclude that the red mud released from SCA

refinery would have had a pH of at least 11 and up to 12.7. **Ex. D**, Bock Dep. vol.3, at 433:20-22; 504:13-17.

3. Mr. Bock's Opinion That Exposure to Red Mud Could Cause the Type of Injuries Plaintiffs Suffered Is Based on Substantial Evidence.

While Defendants seek to exclude Mr. Bock's testimony on the grounds that there is no reliable data to support his conclusion that the high pH red mud would pose a risk of contact dermatitis, alkali burns, and eye injury, the existence of these risks is essentially conceded by the Defendants. Indeed their own Material Safety Data Sheet for red mud unequivocally states that the material can cause severe irritation and burns to the skin and eyes, and that the risk of such injuries is especially great when the material is wet.[7] **Ex. G**, Bock Supp. Report, at 3; **Ex. X**, Alcoa Red Mud MSDS, at Bock 005936; *see also* **Ex. Y**, Larsen Dep., at 80:15-25; 91:7-14; 206:7-21; 208:23-209:3 (conceding that contact with high pH materials can cause contact dermatitis, alkali chemical burns, and eye injuries). The MSDS further reports various other adverse health effects, including irritation of the upper respiratory tract and severe irritation when ingested. **Ex. X**, Alcoa Red Mud MSDS, at Bock 005936. The MSDS also instructs workers to use NIOSH-approved respiratory protection, to wear impervious gloves, clothing, and footwear, and to wear safety goggles to avoid contact with red mud. *Id.* at Bock 005938. Notably, SCA required its bulldozer operators to wear respiratory protection to protect them from the red dust coming off of the piles. **Ex. Z**, Luciana (SCA safety supervisor) Dep., at 37:9-17 & 37:25 - 38:4 & 38:7-16; 12:5-15.

Mr. Bock took the information provided by the MSDS into consideration, but he also relied on his professional experience and knowledge, along with peer-reviewed literature, in assessing the

[7] *See* **Ex. EE**, Mathew Dep., at 231:2 - 232:3 (stating that it is reasonable to rely on MSDS's in identifying the adverse health effects associated with exposure to the material); **Ex. Y**, Larsen Dep., at 84:10-85:7; 87:7-17. (same).

health risks that would be associated with exposure to the red mud. As Mr. Bock explains in his report, the pH, or alkalinity, of a material is widely recognized to be a major factor in determining the hazard it presents to unprotected human tissue. **Ex. G**, Bock Supp. Report, at 2. Defendants' dermatologist agreed that the pH level of a material serves as a measurement of dose for caustic substances like red mud. **Ex. Y**, Larsen Dep., at 93:8-9; 94:3-23; 95:18-21. Peer-reviewed literature on the subject reports that substances with a pH of 11 to 13 "destroy tissue by dissolving protein and collagen, dehydrating cells, and saponifying [decomposing] fat." **Ex. G**, Bock Supp. Report, at 6-7; **Ex. AA**, Chung, et al., "Cement-Related Injuries: Review of a Series, the National Burn Repository, and the Prevailing Literature," at Bock 007237. Similarly, skin contact with alkalis with a pH greater than 11.5 have been shown to produce extensive injury through liquefaction necrosis. **Ex. G**, Bock Supp. Report at 3; **Ex. BB**, The Individual and Organ Systems, Ch. 15, CLINICAL DERMATOTOXICOLOGY, at 185-189, 199, at Bock 007374–007375. It is a well-accepted scientific principle that caustic material becomes more destructive as the pH approaches 14. **Ex. G**, Bock Supp. Report at 2; *see also* **Ex. Y**, Larsen Dep., at 95:11-13; 111:10-24 (agreeing with general principle that the greater the pH value above neutral, the greater the irritant effect). Additionally, at an alkaline pH, human skin is more permeable to many hazards. **Ex. CC**, An Employer's Guide to Skin Protection, Centers for Disease Control, NIOSH, 1999, 2000, at Bock 007407. Alkalis may cause injury from skin contact, through ocular exposure, inhalation, and ingestion. **Ex. BB**, The Individual and Organ Systems, *supra*, at 200 (Bock 007376). This literature further establishes that sodium hydroxide and sodium carbonate, the caustic components of red mud, are strong bases and strong irritants that have the potential to cause significant tissue damage. **Ex. BB**, The Individual and Organ Systems, *supra*, at 200 (Bock 007376); **Ex. FF**, Determination of Acute Reference Exposure Levels for Airborne Toxicants, March 1999, at Bock 007494–007495.

Not surprisingly, the severity of the injury to human tissue as a result of contact with the red mud is primarily dependent upon the pH of the particular material the individual is exposed to, as even short-term transient exposures to strong alkaline materials can cause significant injuries. *See* **Ex. G**, Bock Supp. Report, at 6-7; **Ex. DD**, Fluhr, et al., Contact Dermatitis and Allergy: Fruit Acids and Sodium Hydroxide in the Food Industry and their Combined Effect with Sodium Lauryl Sulphate: Controlled in vivo Tandem Irritation Study, British Journal of Dermatology, 2004, 151:1039-1048, 1045 (Bock 007483) (finding that "low concentrations and short exposures to [a pH 12 solution of] NaOH [induces] irritation and barrier disruption of long duration.") Additionally, because contact with alkaline substances does not initially cause pain, individuals may unwittingly allow the contact to continue for extended periods of time, increasing the severity of the injury. **Ex. AA**, Chung, *supra*, at Bock 007358; **Ex. BB**, The Individual and Organ Systems, *supra*, at 200 (Bock 007376). Certain tissue areas will also be more susceptible to irritation than others. For example, only a few drops of a pH of 11-12 can cause irritation to the eye. **Ex. G**, Bock Supp. Report, at 6; **Ex. BB**, The Individual and Organ Systems, *supra*, at 200 (Bock 007376).

Contact dermatitis and alkali chemical burns are common injuries associated with contact with materials having a pH in the range of the red mud. **Ex. G**, Bock Supp. Report, at 2-3; **Ex. AA**, Chung, *supra*., at Bock 007358 (discussing the pH-related health effects associated with exposure to cement, which has a pH similar to that of the red mud). Related symptoms may include itching (pruritus) of the skin in exposed areas, skin redness or inflammation in the exposed area, tenderness of the skin in the exposed area, localized swelling of the skin, warmth of the exposed area, and lesions. **Ex. G**, Bock Supp. Report, at 3; **Ex. BB**, The Individual and Organ Systems, *supra*, at 185, 200 (Bock 007376, 007276). It may also involve oozing, draining or crusting, and may become scaly, raw or thickened. *Id.*

Defendants ignore this compelling data, and argue that Mr. Bock cannot opine "about the health effects of potential exposures to high pH materials" because he "is not a medical doctor" and because "he has not observed the symptoms" experienced by Plaintiffs. D.Mem. at 25. Defendants' argument fails to recognize the distinction between the expertise required to diagnose the cause of a particular injury or illness and that required to identify risks associated with exposures to hazardous substances. The argument also, once again, ignores Mr. Bock's testimony. As Mr. Bock explained during his deposition, he intends to offer opinions as to the types of adverse health effects that would be associated with exposure to red mud; he does not intend to offer opinions as to the cause of specific health effects suffered by Plaintiffs in this case. *See* **Ex. D**, Bock Dep. vol.3, at 579:5-18 (explaining his role as an industrial hygienist and distinguishing that role from the role of a diagnosing physician). Thus, the fact that Mr. Bock is not a medical doctor in no way renders him unable to opine on the types of injuries that could be caused by exposure to red mud.

4. Mr. Bock's Opinion That Plaintiffs' Exposure to Red Mud Was Significant is Based on Substantial Evidence.

In evaluating whether Plaintiffs' exposures to the red mud were significant, Mr. Bock's investigation considered the exposure conditions described by the plaintiffs in combination with his finding that red mud accounted for the majority of the red dust and slurry that was released from the refinery. **Ex. F**, Bock Report at 10-12. Mr. Bock reviewed Plaintiffs' affidavits, in which they described in detail the conditions in their homes and in their yards during and after the hurricane. *Id.* For example, George Rodriguez reported "red dust blowing into [his] house," and Sonia Cirilo reported "red water coming in through [her] windows." *Id.* Raquel Tavarez reported that the red water "saturated [her] furniture," and Josephat Henry reported that "about a half inch of red dust covering the floors in [his] house." *Id.* Maud Drew described the "pile[s]" of red dust that

remained after the hurricane. *Id.* Plaintiffs also described conditions in which they were subjected to direct contact with the material. *Id.* For example, Sonia Cirilo reported that she was "soaking wet from the red water while [she] held the doors, that she "was breathing the air filled with dust," and that "[t]he red water got into [her] eyes." *Id.* George Rodriguez reported that he and his family "were covered with the red dust and red water." *Id.* Mercedes Rosa reported that "[e]veryone in the house was covered" with the red dust. *Id.*

Thus, Plaintiffs described in detail conditions which caused them to come into direct contact with the red dust and red water that was carried by the hurricane winds and rain. *See id.* Plaintiffs also reported the presence of the red dust persisted for days, weeks, and even months after the hurricane. *See id.* This fact was confirmed by the ATA red mud test, in which measurements of the total and respirable particulates in the room demonstrated that red mud particulates continued to be present during periods of activity in the room even after the room had been cleaned repeatedly.[8] **Ex. F**, Bock Report at 20; **Ex. B**, Bock Dep. vol. 1, at 190:6-19. Thus, the evidence demonstrates that exposure would have involved prolonged and repeated direct contact with skin and eye tissues as well as ingestion of the material.

Because tissue damage can occur with brief contact to caustic materials such as red mud, as explained in section B(3), *supra*, evidence showing that Plaintiffs would have experienced substantial direct and prolonged skin and eye contact with red mud particulates, and that in many cases, the material would have been wet when the contact occurred, supports Mr. Bock's conclusion that Plaintiffs' exposures were significant, i.e. that their exposures could reasonably result in the

[8] Defendants argue that because respirable particulates were not detected in some ATA test samples, the test did not support a finding of prolonged exposure. D.Mem. at 13-14. That argument is unavailing because it ignores the fact that elevated levels of total particulates were detected in samples even after cleaning. The case of skin and eye injuries, such as those reported by Plaintiffs, would not be limited to exposure to respirable particles, as injuries to eye and skin tissues do not depend upon the presence of particles that can be inhaled into the lungs.

types of injuries typically associated with exposure to materials with a pH of 11 to 12.7. **Ex. G**, Bock Supp Report at 7; **Ex. B**, Bock Dep. vol. 1, at 73:3-14, 98:1-11; 111:11-16. Under the circumstances, the data relied upon provide a reliable basis for determining that Plaintiffs' exposures were sufficient to result in the type of injuries described by Plaintiffs. *See Heller v. Shaw*, 167 F.3d 146, 157 (3d Cir. 1999) ("hard evidence of the level of exposure to the chemical in question" is not necessary for a medical expert to testify on causation); *Ruiz-Troche v. Pepsi Cola Bottling Co.*, 161 F.3d 77, 86 (1st Cir. 1998) (requiring precise levels of exposure "that science realistically cannot achieve" is inconsistent with *Daubert*); *Wright v. Willamette Indus., Inc.*, 91 F.3d 1105, 1106 (8th Cir. 1996) (holding that evidence regarding exposure does not have to be "mathematically precise"); *Westberry v. Gislaved Gummi AB*, 178 F.3d 257 (4th Cir. 1999) (explaining that, "while precise information concerning the exposure necessary to cause specific harm to humans and exact details are beneficial, such evidence is not always available, or necessary, to demonstrate that a substance is toxic to humans given substantial exposure...." and holding that, although the expert "did not point to a specific level of airborne dust, there was evidence of substantial exposure").

Despite the substantial data supporting Mr. Bock's conclusion that Plaintiffs experienced significant exposures to the red mud, Defendants argue that Mr. Bock's opinions should be excluded in their entirety because a test he used to evaluate the properties of red mud "did not reliably replicate Hurricane Georges." *See* D.Mem. at 7-19, 22-23. Defendants' contention is without merit. Courts have repeatedly recognized that a test need not recreate the specific event at issue when it is relied on only to show how certain materials or objects tend to behave or function generally. *See, e.g., Nachtsheim v. Beech Aircraft Corp.*, 847 F.2d 1261, 1278 (admitting tests that were offered, not to recreate the accident, but to demonstrate that float valves will not function as intended under some conditions); *Champeau v. Fruehauf Corp.*, 814 F.2d 1271, 1278 (admitting experiment that

was offered, not to recreate the accident, but to show how brakes performed generally).

As Mr. Bock explained in his deposition, the ATA test was not intended to recreate the hurricane, and it did not inform Mr. Bock's opinions as to whether or to what extent the winds driven by Hurricane Georges caused red mud to enter into individual Plaintiffs' homes. **Ex. B**, Bock Dep. vol.1, at 146:20-24; 150:18-21; 151:3-20; 190:6–19. Rather, the test demonstrates that red mud particles, once introduced into a home, tend to settle onto surfaces, to persist after attempts to remove the material, and to become re-entrained during periods of activity in the home. *Id.* at 190:6-19. Thus, Defendants' motion to exclude opinions based on the ATA test because it did not reliably simulate the hurricane should be denied. Moreover, because only a small portion of one of Mr. Bock's opinions is based on the ATA experiment, the bulk of his opinions are admissible even if the experiment is disregarded.

III. CONCLUSION

As set forth above, as well as in Mr. Bock's expert reports and depositions, the opinions he will offer in this case are based on good grounds and will assist the trier of fact to understand the evidence and to determine facts at issue. Mr. Bock is well qualified to evaluate data related to emissions exposures and associated health risks. Defendants' motion to exclude Mr. Bock should, therefore, be denied.

Dated: January 26, 2009

Respectfully submitted,

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CERTIFICATE OF SERVICE

THIS IS TO CERTIFY that on January 26, 2009 I electronically filed the foregoing **Memorandum in Opposition to Defendants' Daubert Motion to Exclude the Reports, Opinions, and Testimony of Clayton A. Bock, CIH** with the Clerk of the Court using the CM/ECF system, which will send a notification of such filing (NEF) to the following:

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